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METHOD OF ULTRASONIC INSPECTION OF
MANUFACTURED PRODUCTS HAVING A COARSE-
GRAINED STRUCTURE

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Wright-Patterson Air Force Base, Ohio

17 November 1972

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FTD-HT-23-1221-72

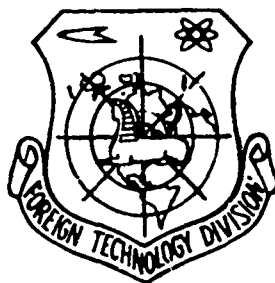
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by

V. T. Vlasov and I. N. Yermolov



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UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Foreign Technology Division Air Force Systems Command U. S. Air Force		2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	
3. REPORT TITLE METHOD OF ULTRASONIC INSPECTION OF MANUFACTURED PRODUCTS HAVING A COARSE-GRAINED STRUCTURE		2b. GROUP	
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Translation			
5. AUTHOR(S) (First name, middle initial, last name) Vlasov, V.T.; Yermolov, I.N.			
6. REPORT DATE 18 March 1969		7a. TOTAL NO. OF PAGES 37	7b. NO. OF REFS
8a. CONTRACT OR GRANT NO.		8b. ORIGINATOR'S REPORT NUMBER(S) FTD-HT-23-1221-72	
8c. PROJECT NO.		8d. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
10. DISTRIBUTION STATEMENT Approved for public release; distribution unlimited.			
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY Foreign Technology Division Wright-Patterson AFB, Ohio	
13. ABSTRACT Microfiche of abstract contains graphic information. The device improves the resistance against interferences in ultrasonic flaw detection. The ultrasonic generator (2) radiation characteristic width is controlled by the circuit (4). Ultrasonic pulses are radiated into the object through Piezoelectric transducers (10). The ultrasonic oscillation beam width varies in accordance with the law determined by the master generator (3). The power of the radiated oscillations is maintained constant. Reflected signals are so converted that the voltage value applied to the circuit (6) input for separation of the signal from a defect, is proportional to the reflected signals mean intensity. By setting certain law of the directional characteristic width variations as function of time, the useful signal can be separated from the received signal and noise. In absence of a flaw the reflected signal is constant, without the component varying in accordance with the above law, so that the voltage at the circuit (6) output is nil. The device comprises further a synchroniser (1); preamplifier (5); amplifier (7); sweep generator (8) and indicator (9). AA1210512			

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DD FORM 1473
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Security Classification

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Security Classification

FTD-HT- 23-1221-72

EDITED TRANSLATION

FTD-HT-23-1221-72

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By: V. T. Vlasov and I. N. Yermolov

English pages: 3

Source: USSR Patent No. 279146 (Appl. No.
1319369/25-28, March 18, 1969), 1970,
2 pages.

Requester: ASD

Translated by: Capt. D. H. Toney

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TRANSLATION DIVISION
FOREIGN TECHNOLOGY DIVISION
WP-AFB, OHIO.

FTD-HT- . 23-1221-72

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Date 17 Nov 19 72

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V. T. Vlasov and I. N. Yermolov

Methods are known of ultrasonic inspection of products having a coarse-grained structure by means of an echo-pulse flaw detector; these methods include radiation of ultrasonic pulses into the product, the reception of echo-pulses and the separation in the background of structural interference of pulse signals reflected from defects.

The proposed method is different from those which are known in that the radiator of the flaw detector is excited by means of a signal of complex form, causing mutually independent changes of noises and signals reflected from the defects; it keeps the average intensity of noises constant and separates the alternating component of the received signals, according to the parameters of which the quality of the product being inspected is judged. Furthermore, the mutually independent changes of noises and signals are caused by changing the width of the radiation pattern's radiation.

Such a difference allows us to raise the noise stability of the ultrasonic defectoscopy of coarse-grained materials and products.

The chart depicts a diagram for accomplishing the proposed method of inspection of products.

The device consists of a synchronizer 1, ultrasonic oscillator 2, a drive generator 3, a circuit 4 to control the radiation pattern, a preamplifier 5, a circuit 6 for separating the signal from the defect, an amplifier 7, a scanning generator 8, an indicator 9 and piezotransducer 10.

The method consists of the following.

The ultrasonic oscillator 2, through radiation pattern width control circuit 4 radiates ultrasonic pulses through the piezo-transducer into the product. As a result, the width of the beam of ultrasonic oscillations will change according to a law which is determined by drive generator 3. Here the power of the ultrasonic oscillations radiated into the product is kept constant. The reflected signals are converted in such a manner that to the input of circuit 6 for separating the signal from the defect voltage, is fed, the amount of which is proportional to the average intensity of the reflected signals. Assigning the fixed law of change of the width of the radiation pattern in time $V = V(t)$, it is possible to separate optimally only the useful signal from the received mixture of signal and noise through circuit 4.

In the absence of a defect, the average intensity of the reflected signal will be constant, but it will not contain a component which changes according to law $V(t)$, and because of this, the voltage at the output of the circuit 6 for separating the signal from the defect is equal to zero.

In the presence of a signal at the output of circuit 6 for separating the signal from the defect a signal appears, since the reflected signal will contain a component which changes according to the law $V(t)$. From circuit 6 the signal proceeds through the amplifier to the indicator.

Subject of the Invention

1. A method of ultrasonic inspection of a product having a coarse-grained structure using an echo-pulse flaw detector, which consists of radiating ultrasonic pulses into the product, the reception of echo-pulses and the separation in the background of structural noises of impulse signals reflected from the defects, *is distinguished*, in that, with the goal of raising the noise stability properties of the inspection, the radiator of the flaw detector is excited by a signal of a complex form, causing mutually-independent changes of the noises and signals, reflected from the defect, the average intensity of noises is kept constant and the variable component of the received signals, is separated, according to the parameters of which the quality of the inspected product is judged.

2. The method in paragraph 1 *is distinguished* in that, with the aim of raising precision, mutually-independent changes of the noises and signals are realized by changing the width of radiation of the radiation pattern.

